

REMARKS

Applicants have amended claims 2, 11, 28, and 31 and added new claims 49-61 to more clearly and particularly claim the compositions of semiconductor nanocrystals and compounds associated thereto. Specifically, new independent claim 49 recites a semiconductor nanocrystal; an overcoating layer disposed on a semiconductor nanocrystal; an outer layer disposed about the overcoating layer; and a compound associated with the overcoating layer via a connecting ligand. New independent claims 56 and 58 recite a water-soluble composition including a water-soluble semiconductor nanocrystal which exhibits photoluminescence having specific quantum yields of greater than 10% (claim 56) or between about 10-30% (claim 58) in water. New independent claim 59 recites a semiconductor nanocrystal including a ligand of the formula, $H_zX((CH_2)_nCO_2H)_y$ and a salt thereof, where X is S, N, P or O=P, $n \geq 6$, and z and y are selected to satisfy the valence requirements of X; and new independent claims 60 and 61 recite a semiconductor nanocrystal including bi-dentate and tri-dentate ligands, respectively. Support for these amendments can be found, for example, in the specification at pages 12 and 13, and in Figures 7-9, and in claims 27-30, 37, and 38. No new matter has been introduced.


Applicants acknowledge the allowable subject matter covered by claims 30, 37, and 38 and note that new independent claim 59 includes the ligand recited in claim 30, and new independent claims 56 and 58 include the increased quantum yields recited in claims 37 and 38, respectively.

Claims 1-45 and 49-61 are currently pending in the application. Reconsideration of the application is respectively requested in view of the following remarks.

Rejections Under 35 U.S.C. § 112, Second Paragraph

Claims 1-45 stand rejected under 35 U.S.C § 112, second paragraph as being indefinite. In particular, the Examiner identified deficiencies in claims 1, 2, 11, 22-24, 28, and 31.

Regarding claim 1, the Examiner states that the term "associated" in claim 1 is unclear and questions whether the term means "a chemical bond, a close proximity, a chemical group association (belonging to the same family of chemical), etc." See for example the Office Action at page 3, lines 1-3. Applicants note that the term "associated" means a chemical interaction between the compound and the semiconductor nanocrystal. Based on the description provided in the Specification, one skilled in the art, such as a chemist, would have recognized that these



interactions could be classified as covalent, noncovalent, hydrophobic, hydrophilic, electrostatic, van der Waal, or magnetic interactions.

Applicants have corrected several informalities in claims 2, 11, 28, and 31. With respect to claim 2, "the quantum dot" has been replaced with "the semiconductor nanocrystal" to provide an antecedent basis. Claim 11 has been amended to be a complete sentence, claim 28 has been amended to delete the term "substantially," and claim 31 has been amended to complete the Markush group.

With respect to claims 22-24, the Examiner contends that the term "small," which modifies the term molecule, is not defined by the claims and that the "specification does not provide a standard for ascertaining the requisite degree" (Office Action at page 3, lines 7-9).

Contrary to the Examiner's assertion, the specification defines a "small" molecule as:

an organic compound either synthesized in the laboratory or found in nature. Typically, a small molecule is characterized in that it contains several carbon-carbon bonds, and has a molecular weight of less than 1500 grams/Mol. (at page 7, lines 3-6 of the Specification).

Thus, the Specification indeed provides a standard for determining what is meant by the term "small" molecule. Applicants submit that one skilled in the art would have understood the scope of this term based on the guidance provided in the Specification.

Rejections Under 35 U.S.C. § 102

Claims 1-27, 29, 31, 32, 34-36, 39, and 41-45 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 5,990,479 to Weiss et al. ("the Weiss patent"). Applicants submit that the Weiss patent does not constitute prior art.

Submitted herewith is a declaration under 37 C.F.R. § 1.131 and supporting documentation from Mounji Bawendi, a co-inventor named on this application, indicating that Applicants invented the claimed subject matter prior to the November 25, 1997 filing date of the Weiss patent. The Weiss patent is therefore not citable under 35 U.S.C. § 102(e).

For at least this reason, Applicants respectfully request that this rejection be reconsidered and withdrawn.

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Rejections Under 35 U.S.C. § 103

Claims 28 and 33 have been rejected under 35 U.S.C § 103(a) as being unpatentable over the Weiss patent in view of Matsumoto et al. *J. Chem. Phys.*, 100(32):13781-13785 (1996) ("Matsumoto"), and claim 40 has been rejected under 35 U.S.C § 103(a) as being unpatentable over the Weiss patent in view of Dabbousi et al., *J. Phys. Chem. B*, 101:9463-9475 (1997) ("Dabbousi").

Claims 28, 33, and 40 depend from independent claim 1, which recites a composition including a compound and a semiconductor nanocrystal to provide information about a biological state or event. In making these rejections, the Examiner relied on the Weiss patent, the primary reference, for disclosing semiconductor nanocrystals used as probes for biological applications, i.e., the subject matter covered by claim 1. Matsumoto and Dabbousi, the secondary references, were cited for disclosing the limitations required in each of dependent claims 28, 33, and 40, i.e., a teaching of a monodisperse particle population (claim 28), less than 10% rms deviation of the diameter of the semiconductor nanocrystals (claim 33), and ZnS overcoated CdSe nanocrystals (claim 40). See the Office Action at pages 5-6. As discussed above, the Weiss patent is not prior art. Thus, it cannot be used alone or in combination with Matsumoto or Dabbousi to reject the claims.

Neither Matsumoto nor Dabbousi teaches or suggests compositions covered by independent claim 1, let alone those compositions covered by dependent claims 28, 33, and 40. Indeed, Matsumoto describes techniques for narrowing the size distribution of polydispersed CdS nanocrystals such as by size selective photocorrosion. See, for example, the abstract of Matsumoto. Dabbousi, on the other hand, describes the synthesis of (CdSe)ZnS dots, and the structural and physicochemical characterization thereof. Therefore, these references do not teach or suggest using nanocrystals as biological probes by associating a compound to a nanocrystal to provide information about a biological event or state, as required by independent claim 1. As a result, the compositions covered by claims 28, 33, and 40, which depend from claim 1, are neither taught nor suggested by Matsumoto and Dabbousi.

For at least these reasons, Applicants submit that one skilled in the art would not have been motivated to use their nanocrystal as a biological probe and that the claims are patentable over Matsumoto and Dabbousi.



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CONCLUSION

For the reasons stated above, Applicants submit that all of the claims are now in condition for allowance, and early favorable action is solicited. Enclosed is a check in payment of the excess claims fees required by the amendments and the fee for the one month extension of time. Please apply any other charges not covered or any credits to Deposit Account No. 06-1050.

Respectfully submitted,

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